

## **COIN Notes**

**2018-11-09**

### **# COIN side meeting**

<https://trac.ietf.org/trac/irtf/wiki/coin>

Final Agenda

Welcome and agenda

Review of the agenda (Chairs - 5 minutes)

#### **## Jeffrey He**

Presentation of the motivation and draft charter (Jeffrey He, Huawei - 10 minutes)

(slides)

Discussion about working groups and RGs that already have overlapping work such DINRG, T2TRG, ICNRG, ...

Erik N.: 2 Approaches to COIN

Approach from the network: Put computing inside the network.

Alternative view: Put computing closer to the network.

We don't have to decide between those views.

#### **# Computing in the Network**

#### **## Marco Canini**

In-Network Computing is a Dumb Idea Whose Time Has Come (Marco Canini - 10 minutes)

Network programmability is the holy grail

Reliability, Velocity, Performance

Look at PISA architecture with the Barefoot platform

Dirk K: NetPaxos -- what is your position on security and privacy

Answer: It is a research opportunity

## Jeffrey He

In-Network Data-Center Computing - draft-he-coin-datacenter-00 (Jeffrey He - 10 minutes)

Draft overview:

Recent advances (see Marco's talk)

Nicolas Kuhn: Not sure who understands the objectives of draft -- lots of research papers show that you can do a lot of things; what is the purpose of the draft?

Marie-Jose: First version; tried to review the state of the art and to create a list of good questions

## Dirk Kutscher

Compute-First Networking: Rethinking Network Programmability (Dirk Kutscher - 10 minutes)

Dirk: Dovetails nicely with Erik's presentation in T2TRG

We are doing computation today, it is just very limited

Lots of advances in virtual machines, containers, unikernels

Install functions somewhere, steer the packets to go there

Unikernels can be instantiated and destroyed in milliseconds

Can our existing networking gear cope?

Not just consider downstream, but also upstream

Old-school in-network computing

DataCenter: shift tasks to a good place, great if the network will manage the traffic then

Distributed applications  
Proto transports  
Custodial storage  
Multicast fan-out

Dave Oran: multi-variate optimization is np-complete; what is new here?  
Answer: Move overlay/application functions to the network layer

## Dave Oran

Design Challenges for Combining Compute and Networking (Dave Oran - 10-minutes)

"less optimistic view" -- more questions than answers

Today: Industry has strong separation between applications people and networking people -- often not friendly to one another  
E.g., who controls firewall rules? All duplicated -- application layer, network layer

What is the different about a "network function"?

Heterogeneous compute (cf. A12X chip)  
Trying to do the same thing with interconnects that are performance bottlenecks and have independent failure modes

Programming models  
-- general purpose  
-- non-turing like P4 (no loops)  
-- functional programming languages (Haskell, Erlang)  
-- interpreted (Python, Java) -- great for gp computing, resource management  
less clear

Large penalty for missing wire rate in switches

Maybe resurrect dataflow programming, completely async

where are the big-win apps?  
-- privacy-preserving analytics  
-- automotive (but who pays)  
-- avoid reinventing CDNs  
data center

- map-reduce, ML training optimizers
- really fast consensus
- scalable KV stores with caches

Are these completely separate or is there overlap

Dirk: That is exactly the question that this group will be able to answer

Marie-Jose: Find applications that need both

Erik: In the data center, placement is simple; edge/fog... I can find out where my packets are traveling; routing protocols may provide info for placement (but that may help in data centers that are no longer flat)

Ravi Ravindran: Access networks?

Dave: I said "edge" -- there are many edges...

## Diego Lopez

A Few Musings on Elastic Network Edges and In-Network Computing (Diego Lopez - 5 minutes)

(see slides)

## Liang Geng

How edge intelligence is accelerating the convergence of networking and computing (Liang Geng - 10 minutes)

China Mobile:

- 1 Edge Cloud -- city to base station
- 2 on-premise edge devices (plug and play)

Edge computing  $\neq$  NFV

Edge computing is focusing on applications, not network functions

Telco 10s of regional data centers, mostly used for NGN radio network

NFV Zone, EC Zone

## Hannu Flinck

Edge Computing APIs (Hannu Flinck – 5 minutes)

ETSI MEC  
OpenAPI in YAML and JSON...  
MEC-012, 028, 013, 014, 015

# Applications Enabled by COIN

## 9 Eve Schooler

Ubiquitous Witness/reverse CDN (Eve Schooler - 10 minutes)

Increasing numbers of things include cameras  
-> Data Stewardship!

Ubiquitous witness:  
- anomaly triggers evidence collection  
- securely stored in black box  
- post facto, enable exploration

What is interesting:  
Video rCDN (reverse CDN)

[[Like the "Mind's Eye" scenario from the movie Anon]]

Network becomes a database that we can query

## Michael McBride

Edge Data Discovery (Michael McBride - 10 minutes)

Eve/Carlos/Mike/Dirk

Deluge of data; discover that?

Gap 6: edge data discovery: find required data from edge databases,  
consolidate it, perhaps name it

Dave Oran: "low latency"? None of the apps seem to be  
Eve Schooler: industrial vs. human in the loop -- tens to hundreds of milliseconds  
Dave: But none of your examples are  
-> point taken

Elevator use case:

100s of sensor, vibration, temperature, floor, speed, ...

Existing protocols:  
Resource directories?

## Rachel Chen

Machine Learning (Rachel Chen - 10 minutes)

(Skipped)

## MJM

In Network Computing Enablers for Extended Reality - draft-montpetit-coin-  
XR-01 (MJM - 10 minutes)

(Skipped)

## Chairs

Next steps (Chairs - 5 minutes)

First meeting  
Thanks from Marie-Jose

Next meeting in Prague  
Marco Canini and Robert Soule have already shown interest in presenting.